

What is claimed is:

1. A torque sensor, comprising:
 - a magnetic metal film with magnetic anisotropy attached to a torque transmission shaft;
 - 5 an exciting coil and a detector coil each installed near the magnetic metal film;
 - a detection circuit including an adder that adds an output of the detector coil and a reference signal when the exciting coil is energized by an exciting power source and a phase comparator that compares an output of the adder and the reference signal in phase; and
 - 10 a torque detector that detects a torque applied to the torque transmission shaft based on the output of the phase comparator.
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2. A torque sensor according to claim 1, wherein the detection circuit further includes a waveform shaper that waveform-shapes the output of the adder and the reference signal.
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3. A torque sensor according to claim 1, wherein the reference signal is generated by the exciting power source.
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4. A torque sensor, comprising:
 - a magnetic metal film with magnetic anisotropy attached to a torque transmission shaft;
 - 25 an exciting coil and a plurality of detector coils each installed near the magnetic metal film;
 - a detection circuit including a plurality of adders that add respective outputs of the detector coils and the reference signal when the exciting coil is energized by the

exciting power source, a plurality of phase comparators that compare respective outputs of the adders and the reference signal in phase; and a differential amplifier that inputs respective outputs of the phase comparators and amplifies a difference between the outputs; and

5 a torque detector detects a torque applied to the torque transmission shaft based on an output of the differential amplifier.

10 5. A torque sensor according to claim 4, wherein the detection circuit further includes a plurality of integrating circuits that convert the respective outputs of the phase comparators in voltage values,

the differential amplifier inputs the voltage values resulting from voltage conversion in the integrating circuits and amplifies a difference between the voltage values, and

15 the torque detector detects direction and magnitude of the torque applied to the torque transmission shaft from polarity and magnitude of the difference voltage value.

20 6. A torque sensor according to claim 4, wherein the detection circuit further includes a plurality of waveform shapers that waveform-shape the respective outputs of the adder and the reference signal.

25 7. A torque sensor according to claim 4, wherein the reference signal is generated by the exciting power source.

8. A torque sensor according to claim 4, wherein the torque sensor is installed in a vehicle electric power steering system that uses an electric motor to provide

steering torque assistance and detects the steering torque of the vehicle electric power steering system.